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AUTHOR Shaul, Marnie S.
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ABSTRACT

Pursuant to a congressional request, the United States General Accounting Office (GAO) has provided information on math and science education that focuses on: (1) key efforts undertaken by the Department of Education, the National Institutes of Health (NIH), and the nine federal agencies under the purview of the House Committee on Science that supported the development and dissemination of comprehensive kindergarten through 12th-grade mathematics and science curriculum materials and the characteristics of these efforts; (2) the extent to which federal agencies coordinated their efforts to develop and disseminate these materials; and (3) the extent to which agencies assessed the quality and use of these materials. Data collection methods consisted of interviewing agency officials, reviewing agency documents, and surveying agencies. Some results indicate that GAO agencies used a variety of approaches to develop, promote awareness of, and distribute mathematics and science materials for K-12; of the 11 agencies GAO surveyed, nine identified 210 projects that were actively developing mathematics and science materials in fiscal year 1999, and the Department of Education and the National Science Foundation (NSF) supported the development of two-thirds of these projects as part of their efforts to improve the teaching and learning of math and science. (ASK)

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United States General Accounting Office

GAO

Report to Congressional Requesters

July 2000

ED 445 940

MATH AND SCIENCE EDUCATION

Comprehensive Information About Federally Funded Materials Not Available

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2

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Contents

Letter 3

Appendixes

Appendix I: Material Development Efforts, by Agency 26
Appendix II: Math and Science Materials That Became Available During Fiscal Year 1999, by Agency 29
Appendix III: Comments From the Department of Education 35
Appendix IV: Comments From the National Science Foundation 37
Appendix V: Department of Health and Human Services 39
Appendix VI: National Aeronautics and Space Administration 43
Appendix VII: GAO Contacts and Staff Acknowledgments 44

Tables

Table 1: Math and Science Projects Active in Fiscal Year 1999 8
Table 2: Examples of Materials Produced by Projects 12
Table 3: Education's Clearinghouses for Educational Information 18
Table 4: Quality Assessment Status of 61 Mathematics and Science Materials That Became Available in Fiscal Year 1999, by Agency 19

Figures

Figure 1: Target Audience of Materials in Development During Fiscal Year 1999 10
Figure 2: Primary Orientation of Projects in Development During Fiscal Year 1999 11
Figure 3: Approaches Used by Agencies to Promote Awareness of Materials Produced in Fiscal Year 1999 13

Abbreviations

AAAS	American Association for the Advancement of Science
AID	Agency for International Development
DOE	Department of Energy
EPA	Environmental Protection Agency
ERIC	Educational Resource Information Center
ESEA	Elementary and Secondary Education Act of 1965
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FREE	Federal Resources for Educational Excellence
GEM	Gateway to Educational Materials
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
OSE	Office of Science Education
USGS	U. S. Geological Survey

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United States General Accounting Office
Washington, D.C. 20548

Health, Education, and
Human Services Division

B-283219

July 12, 2000

The Honorable F. James Sensenbrenner
Chairman
The Honorable Vernon Ehlers
Vice-Chairman
The Honorable Ralph M. Hall
Ranking Minority Member
Committee on Science
House of Representatives

The Honorable Eddie Bernice Johnson
Ranking Minority Member
Subcommittee on Basic Research
Committee on Science
House of Representatives

In fiscal year 1999, the federal government invested an estimated $2.5 billion in mathematics and science education. This investment, which was spread across multiple federal agencies, supported a wide range of activities—from research on and development of curriculum materials to teacher training and professional development. However, recent assessments of student performance in mathematics and science demonstrated that, although U.S. fourth graders did relatively well in both mathematics and science, 12th-grade students were far from the goals set by the Bush administration and the 50 state governors of being first in the world by the year 2000. As a result, there is a growing concern that United States mathematics and science education may not be providing students with the skills necessary to succeed in the work place or in a global economy.

Given these concerns, you asked us to determine (1) the key efforts undertaken by the Department of Education (Education), the National Institutes of Health (NIH), and the nine federal agencies under the purview of the House Committee on Science[1] that supported the development and dissemination of comprehensive kindergarten through 12th-grade mathematics and science curriculum materials[2] and the characteristics of these efforts; (2) the extent to which federal agencies coordinated their efforts to develop and disseminate these materials; and (3) the extent to which agencies assessed the quality and use of these materials. To obtain this information we interviewed agency officials and members of professional associations and reviewed agency documents. We also surveyed the 11 agencies to determine how they generally developed, disseminated, and evaluated these types of materials. Within these agencies, we conducted a second survey of curriculum development projects that were active in fiscal year 1999.[3] We performed our work between June 1999 and June 2000 in accordance with generally accepted government auditing standards.

Results in Brief

Agencies used a variety of approaches to develop, promote awareness of, and distribute mathematics and science materials for kindergarten through 12th grade. Of the 11 agencies we surveyed, nine identified 210 projects that were actively developing mathematics and science materials in fiscal year 1999. Education and NSF supported the development of two-thirds of these projects as part of their effort to improve the teaching and learning of math and science. However, most other agencies we reviewed generally developed these materials as part of their goal to increase public awareness

[1]The Department of Energy (DOE), the Environmental Protection Agency (EPA), the Federal Aviation Administration (FAA), the Federal Emergency Management Agency (FEMA), the National Aeronautics and Space Administration (NASA), the National Institute of Standards and Technology (NIST), the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS).

[2]Materials refer to comprehensive materials sets that contain all of the components a teacher would need to teach and a student would need to learn one or more mathematics and/or science concepts. In some cases, agencies developed materials directly using agency staff. In other cases, agencies provided funding or expertise to others.

[3]FEMA and NIST did not develop materials in fiscal year 1999. NSF materials under development in fiscal year 1999 did not become available for use during fiscal year 1999. NSF materials developed with funds from previous years did become available during fiscal year 1999, but are not included in this study because they did not fall within the criteria established for inclusion.

of a specific subject, rather than to improve math and science education. Overall, the materials incorporated the use of technology, such as computer software and the Internet, and projects tended to focus on science rather than math. To promote and distribute these materials, agencies generally relied most heavily on resources that were available within the agency, such as agency-sponsored conferences and workshops and agency publication distribution centers. In addition, agency officials reported that there is a trend toward making the materials available on-line through the Internet.

To some extent, agencies producing math and science materials coordinated their efforts within and across agencies and with state and local organizations. Of the nine agencies that developed math and science materials in fiscal year 1999, four had some internal mechanism for coordinating some or all of their agency's projects. Some agencies also coordinated efforts on an informal basis. Education and NSF, two agencies that share the goals of improving teaching and learning of math and science, worked with other agencies through an informal network of individuals involved in the development of materials. NIH coordinated its efforts through intraagency communication channels such as the Science Education Resource Group and the Office of Science Education. Two other agencies with related goals, EPA and USGS, also coordinated efforts with each other as part of their efforts to promote public awareness of scientific information. Some agencies also made some effort to coordinate with state and local organizations in developing math and science education materials. Agencies generally relied on their own distribution mechanisms to disseminate information about materials rather than coordinating dissemination efforts with other agencies. Although the National Clearinghouse for Mathematics and Science Education (Eisenhower Clearinghouse) was established to serve as a central source of information about math and science materials, most agencies did not send the clearinghouse copies of all their math and science materials. As a result, no single comprehensive resource for all federally sponsored materials is available to educators seeking to make informed decisions about these materials.

Information was available about the quality of some of the federally developed mathematics and science materials, but little information was available on the extent to which these materials were used in the classroom. Agencies used a range of methodologies to assess the quality of materials, including piloting and field testing of the materials and the review of customer feedback obtained through comment cards and surveys. Of the 61 materials that became available in fiscal year 1999, about half had been assessed for quality at the time of our review.

We make recommendations to ensure that agencies submit their math and science educational materials to the Eisenhower Clearinghouse and evaluate the quality of the educational materials they develop. The agencies that commented on the report generally supported our recommendations.

Background

Education is primarily a state and local function; however, the federal government plays an important role as a source of information, technical and financial assistance, and leadership. Several laws, including the Elementary and Secondary Education Act of 1965 (ESEA), authorize programs that encourage research on and development of innovative teaching strategies and curriculum materials that are tied to curriculum content standards, as well as expanded technical assistance to implement these innovations. Federal agencies generally produce these materials as part of their educational research and development efforts. It is the state and local school districts, however, that decide whether or not they will be adopted.

On a national level, federal education programs such as Title I of the ESEA and Goals 2000 have stressed accountability for student achievement and the development of curriculum content standards and related assessments. Several national organizations, including the National Council of Teachers of Mathematics, the National Science Teachers Association, the National Research Council of the National Academy of Sciences, and the American Association for the Advancement of Science, have developed curriculum standards for mathematics and science education. These standards were designed to establish a broad framework of what mathematics and science curricula should include, such as the topics that should be taught and the extent to which they should be emphasized. States, local school districts, and those who develop educational materials have wide discretion in whether and how they adopt such standards. Similarly, curriculum materials may be selected in a number of ways, depending on the priorities of schools and districts. States and local school districts establish

frameworks that specify the knowledge and skills that students should have at particular points in time and guide the selection of instructional strategies and materials to accomplish these ends. Not all districts and schools, however, use these frameworks to adopt materials in the same way. For example, some districts adopt a single set of materials for use in all classrooms, while other districts allow individual schools to select their own materials from an approved list. Other districts and schools supplement purchased materials with modules that are particularly relevant to local issues.

To make math and science materials available to educators, the Excellence in Mathematics, Science and Engineering Act of 1990 authorized the establishment of the clearinghouse now known as the Eisenhower Clearinghouse. The Eisenhower Clearinghouse serves as a permanent repository of math and science education instructional and curriculum materials for kindergarten through 12th-grade educators and disseminates information about these materials to the public. The ESEA also requires each federal agency or department that develops mathematics or science instructional material or programs to submit copies of the material or program to the Eisenhower Clearinghouse.

Agencies Used a Variety of Methods to Develop and Disseminate Materials

Agencies used a variety of approaches to develop, promote, and distribute math and science materials for kindergarten through 12th grade. Education and NSF funded two-thirds of the 210 projects that produced math and science materials in fiscal year 1999. Of the nine agencies, NSF, Education, and NIH supported the development of educational materials as part of their efforts to improve math and science teaching and learning. The other agencies we surveyed developed materials as part of their goal to increase public awareness about math and science topics related to their agency's missions. To promote and distribute these materials, agencies generally relied most heavily on resources available within the agency, although agency officials reported an increasing trend toward distributing materials through the Internet.

NSF and Education Provide Most Support for the Development of Math and Science Materials

The agencies we surveyed varied not only in terms of the number of projects they were developing, but also in terms of the cost of these projects. Of the 210 projects we identified, NSF and Education funded 143, or two-thirds.[4] The nine agencies that had math and science projects active in fiscal year 1999 estimated that these projects would cost $314 million.[5] About one-fourth of the projects had an expected final cost of less than $100,000 while about one-third had an expected cost of $1 million or more. NSF and Education supported the development of almost 90 percent of the projects costing $1 million or more. Projects developed by DOE, EPA, FAA, and USGS cost less than $300,000 each. Table 1 shows the number and cost of projects by agencies.

Table 1: Math and Science Projects Active in Fiscal Year 1999

Agency	Number of projects	Reported estimated total project cost (in thousands of dollars)[a]
NSF	93	$106,000
Education	50	179,000
NIH	18	11,130
NOAA	15	12,760[b]
EPA	13	800
USGS	10	288
NASA	4	3,000
DOE	5	880
FAA	2	188[c]
Total	**210**	**$314,046**

[a]This includes the reported estimated cost for all years of multiyear products.

[b]This includes the estimated total cost of the GLOBE program, which is a multiagency project combining NOAA, NASA, and NSF.

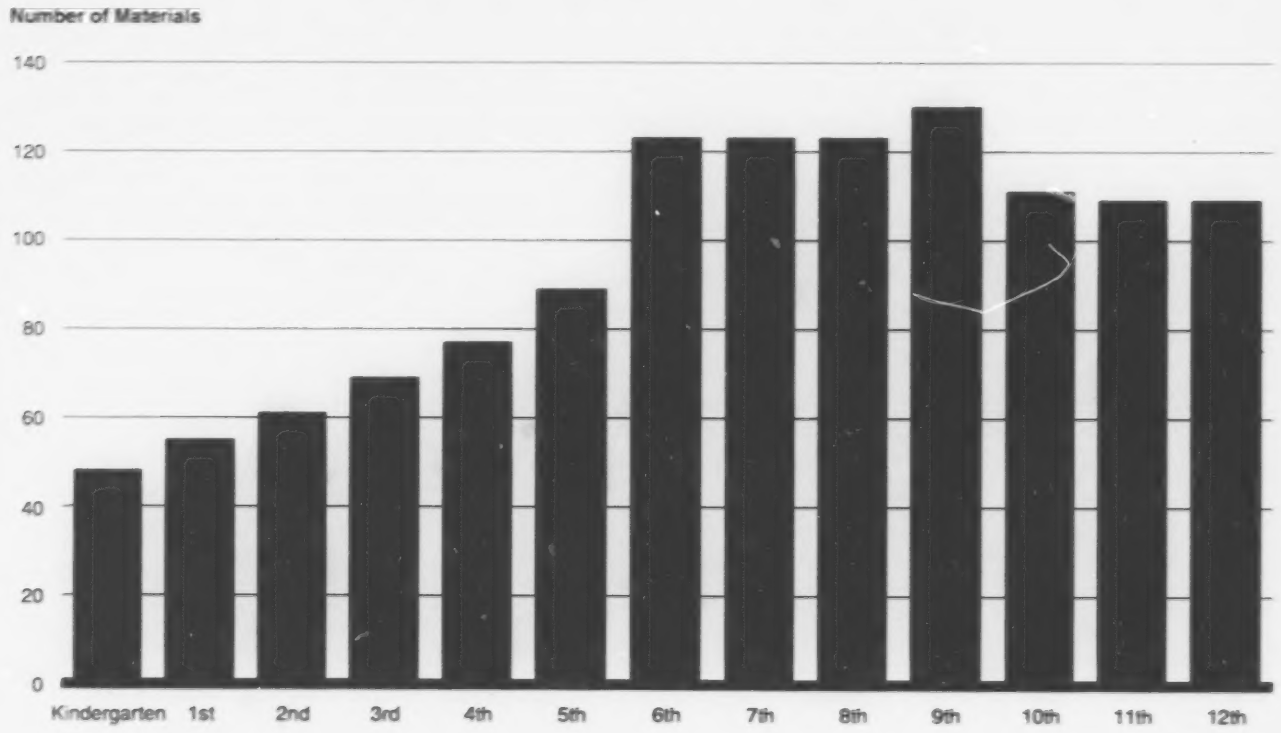
[c]The funds for these projects came from sources other than FAA.

[4]Education generally supports the development of curriculum materials rather than developing them itself. Education's development efforts are generally limited to materials for special populations.

[5]This includes the reported estimated cost for all years of multiyear projects.

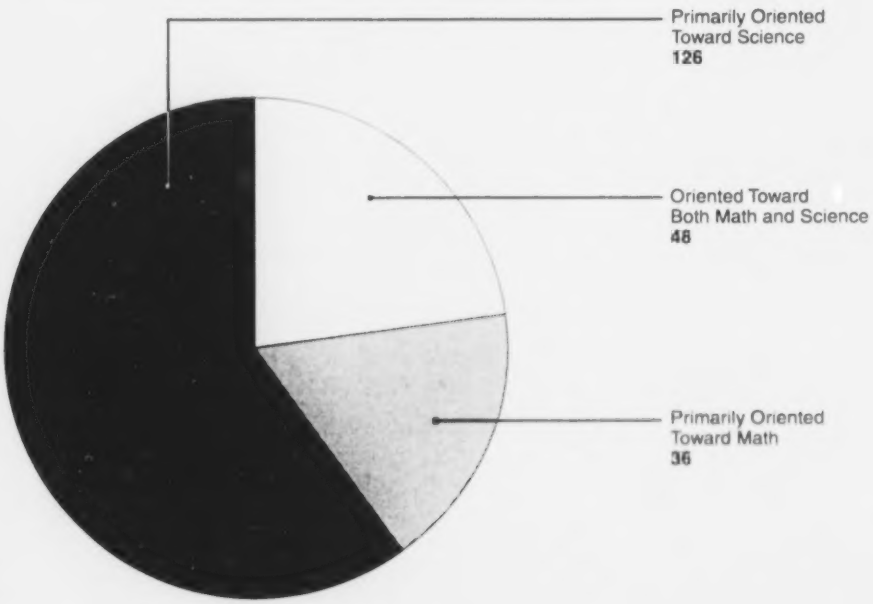
Each agency produced materials that reflected its missions. Although all the agencies had missions related to math and science, three agencies—Education, NSF, and NIH—had missions that focus specifically on improving math and science teaching and learning. NSF's mission, for example, is to "initiate and support science and engineering education programs." Consequently, before NSF funded a project, it expected grantees to show that the project would produce materials that furthered educational practices. In contrast, other agencies developed materials that reflected their scientific missions. In doing so, these materials incorporated math or science; however, improving math and science instruction was not their primary purpose. For example, one of NOAA's missions is to manage and develop coastal ecosystems. To educate students about water resources, NOAA worked with other federal agencies to develop materials on hazards to coastal and ocean areas. Although agencies developed materials for all grade levels, the larger number of projects developed materials for higher versus lower grades, as shown in fig. 1.

Figure 1: Target Audience of Materials in Development During Fiscal Year 1999



Most of the projects focused on science or a combination of math and science and relatively few focused solely on math; NSF and Education funded the projects that included a math focus. Fig. 2 shows the proportion of projects that focused on math, science, or a combination of the two.

Figure 2: Primary Orientation of Projects in Development During Fiscal Year 1999



The 210 projects made 61 materials available in fiscal year 1999. These incorporated technology and emphasized formal instruction. More than 80 percent of these materials provided an opportunity for students and teachers to use computer software or Internet sites, even when in some cases this technology was not necessary to use the materials. Although some of the materials were designed for informal instruction outside the classroom, most were intended for formal classroom instruction. About half the materials incorporated either state or voluntary national education standards. Table 2 provides three examples of some of the types of materials agencies created. For more detail on the characteristics of the 61 materials that became available during fiscal year 1999, see app. II.

Table 2: Examples of Materials Produced by Projects

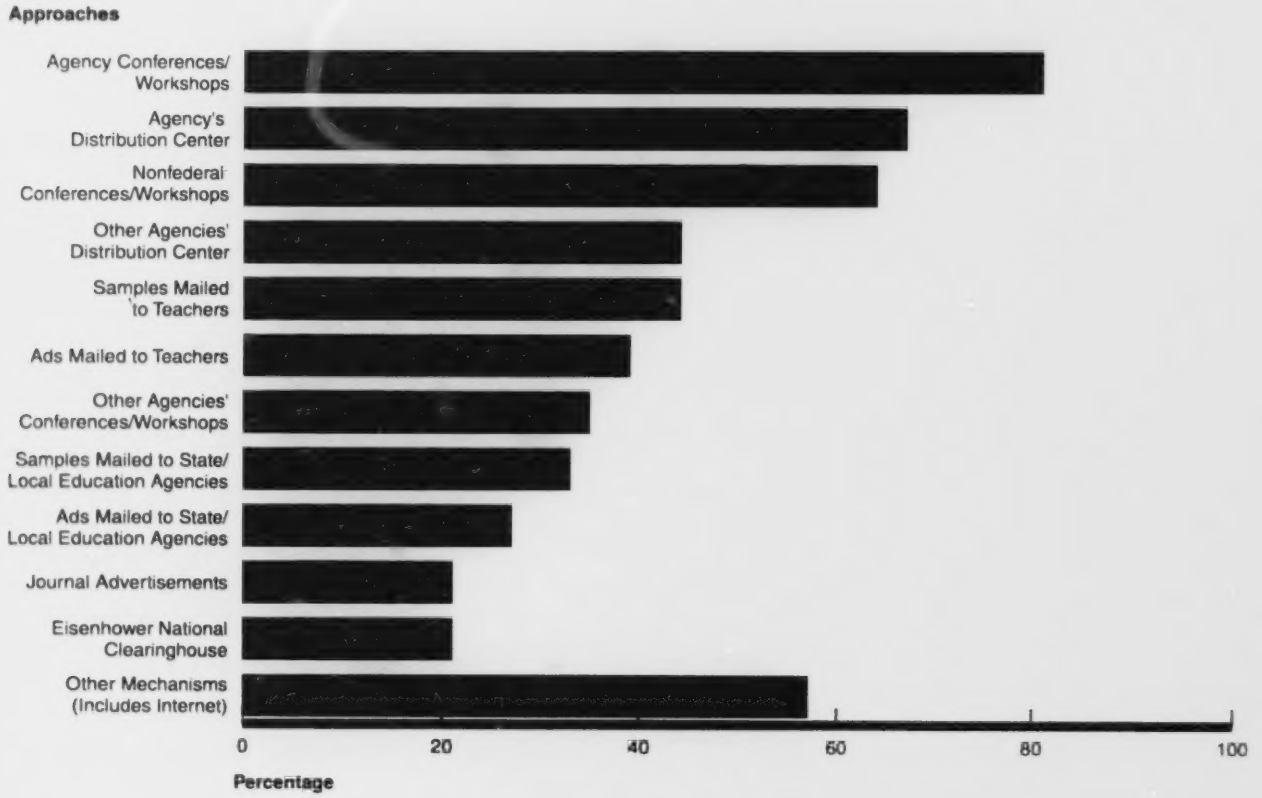
Agency	Project	Materials
NIH	Understanding Gene Testing	Lecture with slides; booklet on frequently asked questions about gene testing
FAA	Aviation in a Bag	Lesson plans on aviation-related science principles, with worksheets
Council on Environmental Quality, Education, EPA, NASA, NOAA, NSF, Office of Science Technology Policy, Peace Corps, Dept. of State, AID,[a] USGS	The GLOBE Program	Web-based interactive program with daily, weekly, and seasonal lesson plans through which students learn scientific research techniques as they study the environment

[a]Agency for International Development.

Agencies Used Multiple Approaches to Promote and Distribute Materials

In promoting materials, agencies relied most heavily on resources that were available within the agency, such as agency-sponsored conferences and workshops, the agency website, or the agency publication distribution centers. Workshops and conferences sponsored by nonfederal organizations or state and local agencies also provided a popular means of promoting materials. As part of their efforts to promote materials, agency officials also reported targeting professional organizations and clearinghouses devoted to specific scientific subjects or topics. For example, the USGS reported targeting its materials to the National Council of Geography Educators, the American Geographical Society, and the National Science Teacher's Association. Officials in other agencies reported using mailing lists from professional organizations in order to target teachers with interests in specific subjects. Fig. 3 shows the different methods that agencies used to promote materials.

Figure 3: Approaches Used by Agencies to Promote Awareness of Materials Produced in Fiscal Year 1999



Note: NSF materials are not included in this chart because NSF did not identify any materials under development with fiscal year 1999 funds that became available in fiscal year 1999. According to agency officials, NSF requires that its products be submitted to the Eisenhower Clearinghouse. Most NSF products are distributed by publishers.

Some approaches to distributing materials were specifically targeted to educators, while other approaches were more general. Many of the methods used to promote awareness of materials were also used as methods of distribution. For example, agencies used workshops not only to make educators aware of materials, but also to distribute materials. One agency, NASA, distributed materials through resource centers specifically for educators located in every state. These are walk-in centers where teachers can browse through materials developed by NASA as well as

materials on related subjects developed commercially or by other agencies and organizations. Educators can also call the center and get assistance choosing materials, learn about professional development opportunities, and have materials and information mailed to them. In contrast, some agencies made no distinction between their general audience and educators when distributing materials. These agencies distributed math and science materials through the warehouses and shipping centers used for all agency publications. For example, several divisions within EPA used the National Service Center for Environmental Publications and Information to distribute their materials. The center published a catalog of EPA publications, but did not separately categorize educational materials. Educators could order materials from the catalog just as they would order any other EPA publication. USGS used a combination of approaches. It had a warehouse and shipping center, but also operated eight Earth Science Information Centers. These centers provided information and sales service for all USGS map products and earth science publications but were not targeted to educators. Finally, other agencies relied on external distributors. For example, NSF required grantees to secure a private publisher as part of their grant. These grantees were then responsible for disseminating the materials.

Although agencies generally relied on the conferences and workshops they sponsored and their publication distribution centers to distribute materials, officials reported a trend toward putting materials online. Many agencies found that putting materials in formats that could be accessed online was more cost-effective than incurring publishing and shipping costs. However, not all schools and teachers have access to the Internet. Even in schools with access, teachers may have limited time on the computers. Furthermore, some officials told us that the schools' equipment might not be adequate for downloading and printing materials. Some of the materials agencies developed were colorful and do not print well in black and white. Other materials, such as posters or videos, may not lend themselves to downloading and printing.

Agency Coordination of Material Development and Dissemination Uneven

The 11 agencies we surveyed made some efforts to coordinate the development of math and science materials internally, across agencies, and with state and local organizations. Four of the agencies had a mechanism to coordinate the development of at least some of their materials. Some agencies coordinated materials development with each other on some of their projects. Agencies also coordinated the development of materials with other nonfederal entities. Most agencies relied on their own

workshops or distribution centers to disseminate materials rather than coordinating with other agencies. The Eisenhower Clearinghouse was established to serve as a central source of information about math and science materials, and agencies are required by law to send copies of their materials to the Eisenhower Clearinghouse; however, only six agencies reported sending copies of at least some of the materials they developed in fiscal year 1999 to the Eisenhower Clearinghouse.

Coordination Efforts Varied Within and Across Agencies

Of the 11 agencies we surveyed, the nine that were developing math and science materials in fiscal year 1999 varied in the extent to which efforts within the agency were coordinated. Four agencies had mechanisms to coordinate the development of some of the materials produced by that agency. NSF was the only agency we surveyed that distributed all of its grants for kindergarten through 12th-grade math and science materials through one office. All the other agencies that were developing materials did so in at least two offices. Some efforts by these separate offices to develop materials were coordinated, while others were not. According to agency officials, NIH coordinated its materials development efforts through intraagency coordination systems such as the Science Education Resource Group and the Office of Science Education (OSE), which increase the awareness of materials development projects in other NIH institutes and centers. In addition, the OSE has consulted with NIH institutes on a number of science education products and serves as a source of educational advice and expertise.

NSF and Education, two agencies that share the goal of improving the teaching and learning of math and science, coordinated the development of materials through an informal network of individuals. NSF officials told us that these informal networks allowed them to achieve their common goals with a high level of creativity and a minimum amount of duplication.

Other agencies with related, although somewhat different, goals also coordinated efforts with each other. For example, both EPA and USGS had goals to promote public awareness of scientific information. EPA's strategic plan included the goal of ensuring that all parts of society have access to accurate information sufficient to effectively participate in managing human health and environmental risks. USGS' strategic plan included the goal of providing reliable scientific information. USGS and EPA, along with several other federal agencies, developed the Water Matters project, which covered topics including Oceans and Coastal Hazards and Hazardous

Waste and Watersheds. By combining their efforts, EPA and USGS were each able to further their goals.

Agencies also coordinated efforts with state and local organizations. Of the 42 projects that reported developing materials in partnership with others, 36 indicated coordination with nonfederal partners. Nonfederal partners included state education agencies, local school districts, individual schools, professional organizations, universities, nonprofit organizations, and television stations. For example, Coastal America, a partnership between federal agencies with stewardship responsibilities for the nation's coastal habitats and resources, worked with local aquariums and related organizations around the nation to promote education on coastal ecosystems. The Aurora project, funded by Education, worked with public school districts and private schools in Oklahoma along with Southwestern Oklahoma State University and the Southwest Educational Development Laboratory to create an interactive, online curriculum where students and teachers could find a variety of educational activities related to geology.

Limited Compliance With Requirement to Submit Materials to Eisenhower Clearinghouse

Education's search of the Eisenhower Clearinghouse and the results of our survey showed that most agencies did not submit all their materials to the clearinghouse as required by the law. According to Education officials, only nine of the materials that became available in fiscal year 1999 were actually found in the clearinghouse's database.[6] Two agencies had policies requiring submission of materials to the Eisenhower Clearinghouse. NASA had a policy to automatically send copies of materials to the clearinghouse and all the materials produced in fiscal year 1999 were in the clearinghouse database. Similarly, NSF built a requirement into grants that grantees submit copies of materials to the clearinghouse. Several other agencies indicated that they did not have policies that require submitting materials, but some indicated that they submitted materials to the clearinghouse. Some agency officials said they wait to be contacted by Eisenhower staff. For example, officials at NIH said that Eisenhower staff contacted them once a year, generally in the fall. NIH uses this as a trigger to update NIH information in the clearinghouse, including removing materials no longer current and adding materials that have passed initial quality assessment review and are being disseminated by the agency. At that time NIH staff look to see what materials have become available and decide about

[6]Although 61 materials became available in fiscal year 1999, we only had enough information to determine the availability of 59 of the materials.

whether to submit them based on how the materials have been received by their intended audience. The results of our survey showed that about 80 percent of projects that developed materials available in fiscal year 1999 did not identify the Eisenhower Clearinghouse as an approach for disseminating information about their materials. Some other agency officials we surveyed indicated they were not aware of the Eisenhower Clearinghouse and its services or were unclear about how to submit materials.

Even though agencies are required by law to submit materials to the Eisenhower Clearinghouse, the clearinghouse staff did not depend on agencies to do so. They indicated that they use a variety of proactive methods to identify and acquire appropriate agency materials. According to clearinghouse officials, their acquisition staff of two has contacted federal agencies annually. Clearinghouse staff told us that when agencies do not coordinate internal efforts to produce math and science materials, the clearinghouse staff had difficulty identifying all the materials an agency has produced. In such cases, clearinghouse staff had to contact different branches or regional offices throughout the agency. Clearinghouse staff also learned about materials from teachers, grant announcements, Internet-based lists, agency catalogs, and agency exhibits at conferences. They acknowledged that they have not had the resources to identify all materials.

Although the Eisenhower Clearinghouse was established to collect and distribute information about federally funded math and science materials, Education also operates three other educational information clearinghouses that could contain references to some math and science materials—the Educational Resource Information Center (ERIC), the Gateway to Educational Materials (GEM), and the Federal Resources for Educational Excellence (FREE) website. However, these clearinghouses may either have a specific focus or contain a broader range of materials. For example, ERIC serves as a source of information on educational research, and generally includes few instructional materials in its database. The FREE website provides direct links to federal agencies' websites that have materials on all academic subjects available on-line. GEM provides teachers with access to collections of Internet-based educational materials available on various federal as well as nonfederal Internet sites, including state, university, nonprofit, and commercial Internet sites. All four of the clearinghouses have as their target audiences educators, researchers, parents of students, and the public. Table 3 shows the characteristics of the different clearinghouses.

Table 3: Education's Clearinghouses for Educational Information

Clearinghouse	Year established	Subjects	Types of materials
Eisenhower	1992	Math and Science	Information on instructional materials and federal education programs
ERIC	1966	Educational research on various academic subjects	Information on some instructional materials, but limited; mostly research on educational practices and techniques
FREE	1997	All academic subjects	Federally funded materials available online
GEM[a]	1996	All academic subjects	Materials available online (most are not federally funded)

[a]Although 175 organizations participate in GEM, most of the agencies we surveyed whose materials became available in fiscal year 1999 did not.

Each of these four clearinghouses had a database that included information on some of the math and science materials identified in our review. However, no single database, including the Eisenhower Clearinghouse, contained information on more than 12 of the materials that became available in fiscal year 1999. Consequently, no single database could provide educators with a comprehensive list of materials available—information that would enable them to make informed decisions about the full range of federally funded science and math materials available for their use.

Limited Information Available on Quality and Use of Materials

Although the 11 agencies we surveyed had some information about the quality of the materials they produced, they had less information about the extent to which these materials were used for classroom instruction. To assess quality, agencies used a range of methodologies, including piloting and field testing materials and reviewing customer feedback obtained through comment cards and surveys. At the time of our review, agencies had assessed the quality of about half of the 61 materials that became available in fiscal year 1999. Although agencies generally tracked the number of materials requested and distributed, they did not collect information on whether the materials were actually used in the classroom.

The extent to which agencies assessed the quality of the materials they developed varied widely across the five agencies that conducted quality reviews in fiscal year 1999. Of the 61 materials that became available in fiscal year 1999, about half had been assessed for quality, according to our survey results (see table 4). Officials from NASA reported that they allowed trial usage of materials, collected data from participants and project managers, and sought third-party evaluation as means to understand the strengths and limitations of the materials produced. Officials in three agencies reported that they had not done quality assessments for any of the materials that became available through their agency during this period.

NIH, Education, and NSF told us that their agencies planned to conduct more extensive quality assessments of their materials in the future. NIH officials indicated that it assesses all its materials before they are disseminated through pilot studies or field trials. Officials at Education and other agencies also told us that, while they had not assessed the quality of all of their materials at the time of our review, they generally intended to do so in the future. NSF requires all grantees to assess the quality of the materials produced under their grants. In addition, when NSF conducts outside reviews of its projects, the quality of the materials produced is also evaluated.

Table 4: Quality Assessment Status of 61 Mathematics and Science Materials That Became Available in Fiscal Year 1999, by Agency

Agency	Number of materials that became available in FY 1999	Number of materials assessed for quality
Education	23	11
DOE	1	0
EPA	2	0
FAA	2	0
NIH	9	4[a]
NOAA	13	7
USGS	7	2
NASA	4	4
Total	**61**	**28**

[a]Comprehensive evaluation planned but not yet conducted for the five other materials.

Two organizations have programs to assess the quality of educational materials and could serve as means of evaluating the quality of some of the

materials produced by the 11 agencies we surveyed. Education and the American Association for the Advancement of Science (AAAS) evaluate samples of federally and commercially developed mathematics and science materials. Education formed a panel of mathematics and science experts and practitioners to evaluate educational programs and recommend those programs that should be designated as exemplary or promising. AAAS Project 2061 has used teams of experienced practicing classroom teachers and higher education faculty to identify the extent to which textbooks identify key mathematics and science concepts and provide instructional strategies likely to help students to learn them. While we do not know if Education's panel of experts or AAAS reviewed any of the 61 materials produced in fiscal year 1999, both organizations could be used to evaluate materials' quality, or provide a model for doing so.

The extent to which educators use agency-developed math and science materials can indicate how well materials have been promoted and their perceived quality. Agency officials reported that although they generally tracked the number of requests that they received for materials, as well as the number of materials they distributed, they generally did not collect information on the extent to which the materials were actually used in the schools. However, while NASA officials told us that it was difficult to obtain information on materials use in the classroom, the feedback that they received from users indicated that the materials have been used and have been effective.

Agency officials identified three factors that contributed to the lack of information on materials usage. First, if the primary purpose of the materials was not to educate kindergarten through 12th-grade students in the classroom but rather to increase public awareness of a specific subject matter, the materials may have been disseminated through channels for noneducational material, making educational materials difficult to identify and track. Second, if the materials were recently released for use in the classroom, they may be too new to have been widely implemented, resulting in limited data on their use beyond that which was available during the pilot or field testing of the materials. Third, the wide range of approaches that administrators and teachers used to implement the materials in the field can significantly affect the extent to which the materials are actually used. For example, a June 1999 report on the evaluation of NSF's Instructional Materials Development Program stated that teachers modified the materials when they felt uncomfortable with

either the content or the associated teaching strategies.[7] Some of the changes included changing the content, sequence, or teaching strategies to make the materials more like what teachers had used in the past.

Conclusions

Each year the federal government makes considerable investments in the development and dissemination of math and science materials for kindergarten through 12th grade. The purpose of the Eisenhower Clearinghouse is to serve as a repository for these materials. However, agencies generally have not regularly submitted materials to the Eisenhower Clearinghouse, even though they are required by law to do so. Because most of the agencies we surveyed do not send materials to the Eisenhower Clearinghouse, educators lack a single database that provides them with a comprehensive list of federally funded materials and may have difficulty learning what materials are available.

Similarly, the agencies we surveyed provide limited information about the quality of their materials. The investment in these materials' development and dissemination warrants an assessment of their quality, especially because their quality may affect if and how they are used. In general, the agencies we surveyed assessed about half of the materials they produced in fiscal year 1999. Because information about quality helps educators select materials, the Eisenhower Clearinghouse includes evaluative information on the materials in its collection, but it can do so only when such information is available. Without this type of evaluative data, educators have limited information for making decisions about which materials will best meet their needs.

Recommendation to the Secretary of Education

We recommend that the Secretary of Education direct the Assistant Secretary for Educational Research and Improvement to ensure that all agencies are aware of their responsibilities to submit materials to the Eisenhower Clearinghouse by notifying them of the requirements under the act and establishing guidelines for agencies to follow in submitting the materials.

[7] See National Science Foundation, *Final Report on the Evaluation of the National Science Foundation's Instructional Materials Development Program*, Directorate for Education and Human Resources, Division of Research, Evaluation, and Communication (June 1999).

Recommendation to the Secretary of Education and the Director of the National Science Foundation

We recommend that the heads of two agencies whose missions directly relate to developing or disseminating educational materials—the Secretary of Education and the Director of the National Science Foundation—inform agencies that do not generally evaluate their educational materials about the importance of conducting such evaluations and about mechanisms available for evaluating their materials, such as AAAS's and Education's expert panel process.

Agency Comments and Our Evaluation

We provided the 11 agencies surveyed with an opportunity to review and comment on the report. DOE, FEMA, NIST, and EPA said that they had no comments on the report. Agencies that commented generally agreed with our findings and conclusions.

Education said that the report did a thorough job of conveying the extent and complexity of the federal investment in science and mathematics education. Education had no comments on our recommendation to the Secretary of Education regarding agencies' submission of materials to the Eisenhower Clearinghouse (see app. III). Regarding our recommendation to the Secretary of Education and the Director of the National Science Foundation that they inform agencies of the importance of evaluating educational materials and evaluation mechanisms available, Education said that our recommendation that the Math and Science Expert Panel review all materials may be overly ambitious. However, we did not recommend that the panel be used this way. Rather, we stated that the panel, along with other organizations and resources, could be a possible source to evaluate materials or to provide information about evaluation approaches. NSF did not provide comments on this recommendation (see app. IV).

NSF commented that it did not believe that the report adequately reflected the agency's major role in mathematics and science materials development (see app. IV). The agency noted that information about specific NSF materials was not included in the survey of curriculum development projects because they did not meet our criterion that the projects' materials became available in fiscal year 1999. While we did not include information about specific materials, we did collect extensive information about NSF's role in the development of math and science materials and reported on it. Throughout the report, we make it clear that NSF has been producing such materials and recognize its key role in their development. Specifically, we

note the number of projects the agency had undertaken, its funding commitments to those projects, and how the agency generally disseminates and evaluates its materials.

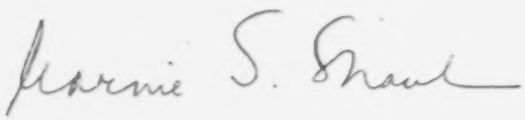
NIH commented that our recommendations would benefit the education process (see app.V). It also commented that its staff were unaware of the requirement to send materials to the Eisenhower Clearinghouse, and noted that this report reinforces the emphasis NIH has placed on the assessment and evaluation of NIH science education materials. NIH had several suggestions for clarifying its education goals and how it coordinates materials. We made changes to the report where appropriate.

NASA supported both of our recommendations (see app. VI).

Several agencies—Education, FAA, NIH, USGS, NOAA, and NSF—provided technical comments, which were incorporated when appropriate.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the Honorable William M. Daley, Secretary of Commerce; the Honorable Richard W. Riley, Secretary of Education; the Honorable William B. Richardson, Secretary of Energy; the Honorable Donna E. Shalala, Secretary of Health and Human Services; the Honorable Bruce Babbitt, Secretary of the Interior; the Honorable Rodney E. Slater, Secretary of Transportation; the Honorable Carol M. Browner, Administrator of the Environmental Protection Agency; the Honorable James L. Witt, Director of the Federal Emergency Management Agency; the Honorable Daniel S. Goldin, Administrator of the National Aeronautics and Space Administration; and the Honorable Rita R. Colwell, Director of the National Science Foundation; relevant

congressional committees; and other interested parties. If you or your staff have any questions concerning this report, please call me on (202) 512-7215. Other contacts and staff acknowledgments are listed in app. VII.



Marnie S. Shaul
Associate Director
Education, Workforce, and
Income Security Issues

Material Development Efforts, by Agency

Characteristic	Description
Department of Education	
Cost	Education's cost was approximately $179 million. Project costs ranged from about $30,000 to about $3.5 million.
Purpose	Education generally limited its efforts to funding projects that develop educational materials that assist in the teaching of a limited number of topics to students with special learning needs, or other target populations. Education also provides seed money for the development of products that fill gaps in what is commercially available. Education's Office of Educational Research and Improvement is charged with disseminating information about education research and practice, which may include math and science materials.
Structure	Education develops materials in several program offices, primarily through grants. Education disseminates information about math and science materials through several clearinghouses and organizations offering technical assistance. The Eisenhower Clearinghouse specifically targets math and science materials for kindergarten through 12th grade. Education identifies and disseminates information about exemplary and promising materials through its expert panels.
Department of Energy (DOE)	
Cost	DOE's cost was approximately $879,000. Project costs ranged from about $25,000 to about $280,000.
Purpose	DOE's education efforts are largely geared toward passing on scientific expertise gained through DOE's research. DOE does not have a mission or goal of developing materials for students in kindergarten through 12th grade, although it does have a goal of educating the public about its work. Most of DOE's education work is done for undergraduate students.
Structure	Different program offices within DOE develop and disseminate materials independently of one another. Most of DOE's projects that develop materials are done by grantees.
Environmental Protection Agency (EPA)	
Cost	EPA's cost was approximately $797,000. Individual project costs ranged from about $5,000 to about $180,000.
Purpose	EPA develops educational materials as part of its mission to ensure that all parts of society have sufficient accurate information to effectively participate in managing human health and environmental risks. The Environmental Education Act directs EPA to establish and use the Office of Environmental Education to improve understanding of the environment. Supporting the development of educational materials for elementary and secondary students is listed as one way to accomplish this goal.
Structure	EPA develops curriculum support materials through its Office of Environmental Education, as well as through other EPA program offices that focus on specific environmental issues. These offices worked independently to develop and disseminate materials.
Federal Aviation Administration (FAA)	
Cost	FAA's two projects that met our definition of developing comprehensive curriculum support materials cost about $2,500 and about $185,000; however, the funds for these projects came from sources other than FAA.
Purpose	FAA is mandated to provide aviation education under the Airport and Airway Development Act of 1970.
Structure	Materials are generally funded by an outside source (grantor) and given directly to an outside receiving organization (grantee). FAA has acted in a collaborative effort in the development of materials by providing information and expertise. FAA assists in disseminating materials in [illegible]gional offices and electronically via the Internet.

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Characteristic	Description
Federal Emergency Management Agency (FEMA)	
Cost	FEMA did not develop materials that met our definition of comprehensive curriculum support materials during fiscal year 1999.
Purpose	FEMA develops educational materials as part of its mission to teach the public how to prevent and prepare for disasters.
Structure	Any one of the four directorates within FEMA, the National Flood Insurance Program, or the United States Fire Administration, may independently develop educational materials for students in grades kindergarten through 12th grade as part of public education.
National Aeronautics and Space Administration (NASA)	
Cost	The estimated total cost of projects sponsored by NASA, for which costs were reported, was approximately $3 million. Each project cost about $1 million.
Purpose	NASA develops educational materials as part of its mission to support educational excellence. NASA has the goal of developing, utilizing, and disseminating science, math, technology, and geography instructional materials based on NASA's unique mission. Materials may also be developed as part of the outreach component of the program or as byproducts of other mission-related work.
Structure	The Office of Human Resources and Education develops educational materials through grants. Mission-oriented programs also develop and disseminate materials in coordination with the Office of Human Resources and Education.
National Institutes of Health (NIH)	
Cost	NIH's cost was approximately $11 million. Individual project costs ranged from about $30,000 to about $2.5 million.
Purpose	Educational material development falls under NIH's overall mission to communicate scientific results and health information to the medical research community, health care professionals, patients, and the general public, including teachers and students. Additionally, the Office of Science Education has a broad mandate to promote science education.
Structure	The Office of Science Education coordinates and provides funding for some educational projects within NIH. Each of NIH's 26 independent institutes or centers may develop and disseminate educational materials.
National Institute of Standards and Technology (NIST)	
Cost	NIST did not develop any materials during fiscal year 1999 that met our definition of being comprehensive curriculum support materials.
Purpose	NIST does not have either kindergarten through 12th grade or general education as part of its mission.
Structure	Employees get involved in educational projects through a variety of informal activities on a voluntary basis. All efforts are unpaid and done on the employees' own time.
National Oceanic and Atmospheric Agency (NOAA)	
Cost	NOAA's cost was approximately $12.8 million. This includes the estimated total cost of the GLOBE program, which is a multiagency project combining NOAA, NASA, and NSF. Project costs range from about $2,000 to about $9.5 million.
Purpose	NOAA develops math and science materials through four offices—the Office of Oceanic and Atmospheric Research, the Fisheries Marine Division, the National Ocean Services, and the GLOBE program.
Structure	Program offices develop materials independently of each other. NOAA's Public Affairs office coordinates the education website and collects materials from the divisions.

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Characteristic	Description
National Science Foundation (NSF)	
Cost	NSF gave a total of $106 million in educational grants to projects that develop math and science materials and were active during fiscal year 1999. Individual grants ranged from $40,000 to $5.2 million.
Purpose	NSF supports the development of math and science curriculum support materials as part of its mission to initiate and support science education programs. Specifically, NSF has a goal of improving achievement in mathematics and science skills needed by all Americans.
Structure	Materials funded by NSF are developed through grants administered by NSF's Directorate for Education and Human Resources.
United States Geological Survey (USGS)	
Cost	USGS' cost was approximately $288,000. Project funding ranged from under $1,000 to about $160,000.
Purpose	The development of educational materials falls under USGS' basic mission to provide reliable scientific information. Generally, the USGS provides scientific information that others can use to develop materials. However, the USGS does develop some educational materials.
Structure	USGS funds projects through the Human Resources Initiative, which oversees funding available for educational use. Additionally, individual noneducational programs within the USGS develop and disseminate materials independently of this initiative and one another.

Note: Funding amounts reflect total costs for multiyear projects that were active in fiscal year 1999.

Appendix II

Math and Science Materials That Became Available During Fiscal Year 1999, by Agency

Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
DOE				
Lesson Plans Describing Fossil Energy and Technology	Science	7–12	Teacher's guide Lesson plan(s) Sample quiz Crossword puzzles	Calculator Computer software Internet site(s)
Education				
Supporting Young Children's Readiness for School Mathematics through Pre-K Classroom and Math Family Curriculum	Math	Pre-K, K	Teacher's guide Lesson plan(s) Material(s) that can only be used once[a]	
Teams Distance Learning Program	Math and science	1–8	Teacher's guide Lesson plan(s) Instructional video(s) Web-based projects and activities Commercially produced hands-on science materials	Calculator Computer software Internet site(s) CD-ROM Laser disc
College of Central Wyoming - Mountain Plains Distance Learning Partnership	Math and science	K–12 Adult education	Teacher's guide Lesson plan(s) Instructional video(s) Permanent material(s)[b] CD-ROM Internet site(s)	
Project Focus on Achieving Standards in Teaching Mathematics	Math	7–9	Teacher's guide Lesson plan(s) Instructional video(s) Permanent material(s)[b] Materials that can only be used once[a] Computer software	Calculator Computer software
WebQuest Units	Science	K–12	Teacher's guide Lesson plan(s) Internet site(s)	Calculator Computer software Internet site(s) Digital camera(s) Computer scanner(s)
Young Astronauts I and II	Math and Science	4–6	Teacher's guide Lesson plan(s) Instructional video(s) Computer software	Internet site(s)
GED Practical Math	Math	High school equivalency program	Teacher's guide Lesson plan(s) Instructional video(s)	

(Continued From Previous Page)

Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
GeogWeb Curriculum Units	Math and Science	K–12	Teacher's guide Lesson plan(s) Computer software Student and parent guide	Calculator Computer software Internet site(s)
K-12 Curriculum Database with Correlated Resources	Math and science	K–12	Lesson plan(s) Instructional video(s)	Calculator Computer software Internet site(s)
Connections Curriculum Units	Math and science	5–12	Lesson plan(s)	Calculator Computer software Internet site(s) CD-ROM
Parent Flash Cards	Math and science	K, 4–10	Teacher's guide Permanent material(s)[b]	Internet site(s)
Math Wings	Math and science	K–6	Teacher's guide Lesson plan(s) Textbook Permanent material(s)[b] Material(s) that can only be used once[c]	Calculator
World Lab	Math and science	K–5	Teacher's guide Lesson plan(s) Textbook Permanent material(s)[b] Material(s) that can only be used once[c]	Calculator
Transition to Advanced Math	Math and science	10	Teacher's guide Lesson plan(s)	Calculator
Community for Learning	Math and science	K–12	Teacher's guide Lesson plan(s) Instructional video(s)	Calculator Computer software
Head Start on Science	Science	K–2	Teacher's guide Lesson plan(s) Permanent material(s)[b]	
Algebra	Math	5–8	Teacher's guide Lesson plan(s) Instructional video(s)	Calculator Computer software
Pacific Algebra Project	Math and science	8–10	Instructional video(s) Internet site(s)	Calculator Computer software Internet site(s)
KID SCIENCE	Science	5–8	Teacher's guide Lesson plan(s) Instructional video(s) Internet site(s)	Internet site(s)

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Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
Envirotackle Box	Math and science	6–8	Teacher's guide Lesson plan(s) Instructional video(s) Internet site(s) Teleconference(s)	Internet site(s) Video streaming
Nature Scene	Math and science	5–8	Teacher's guide Lesson plan(s) Instructional video(s)	Computer software Internet site(s)
Calculus Enhancement	Math and science	11–12	Teacher's guide Lesson plan(s) Instructional video(s) Computer software Internet site(s)	Calculator Computer software Internet site(s) Video streaming CD-ROM
Journeys to Alaska	Math and science	6–8	Teacher's guide Lesson plan(s) Instructional video(s)	Computer software Internet site(s)
EPA				
National Drinking Water Week Kit	Science	K–12	Teacher's guide Lesson plan(s) Worksheet(s)	Internet site(s)
The Water Drop Patch Project: Making a Difference	Science	1–12	Teacher's guide Girl Scouts patch Booklet	Calculator Computer software Internet site(s)
FAA				
Lesson Plans that Fly—Aviation in a Bag	Science	3–6	Teacher's guide Lesson plan(s) Permanent material(s)[a] Material(s) that can be used only once[a]	
Take-Off Series Kit	Math and science	7–8	Teacher's guide Lesson plan(s) Instructional video(s) Computer software Internet site(s)	Calculator Computer software Internet site(s) Videos
NASA				
CERES	Math and science	K–12	Internet site(s)	Internet site(s)
Bioblast	Science	9–11	Teacher's guide Lesson plan(s) Computer software Instructional video(s) Permanent material(s)[a]	Computer software Internet site(s)
Astronomy Village	Science	9–12	Teacher's guide Instructional video(s) Computer software Permanent material(s)[a]	Computer software Internet site(s)

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Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
NASA Connect	Math and science	4–8	Teacher's guide Internet site(s) Instructional video(s)	Internet site(s)
NIH				
Health Science Curriculum Online	Science	7–12	Teacher's guide	Internet site(s)
Understanding Gene Testing	Science	9–12	Textbook Permanent material(s)[a] Tutorial with slides and script	Computer software Internet site(s)
Understanding Cancer	Science	9–12	Internet sites	Computer software Internet site(s)
Estrogen Receptors	Science	9–12	Internet sites	Computer software Internet site(s)
Mind Over Matter: The Brain's Response to Drugs	Science	6–9	Teacher's guide Internet site(s) Permanent material(s)[a]	Internet site(s)
Mystery of the Crooked Cell	Science	7–12	Teacher's guide Lesson plan(s) Permanent material(s)[a] Material(s) that can only be used once[a]	Calculator Computer software Internet site(s) Video conferencing
New Frontiers in Physiology	Science	6–12	Teacher's guide Lesson plan(s)	Calculator Computer software Internet site(s)
Positively Aging	Math and science	6–8	Lesson plan(s)	Calculator Computer software Internet site(s)
My Health, My World!	Science	2–5	Teacher's guide Lesson plan(s) Adventure storybook Language arts supplements Mini-magazine	Calculator Internet site(s) Computer software
NOAA				
Oceans, Coastal Hazards: Hurricanes, Tsunamis, Coastal Erosion	Science	K–7	Teacher's guide Lesson plan(s) Permanent material(s)[a]	Internet site(s)
Biofilms and Biodiversity	Math and science	6–12 Undergraduates Graduates	Teacher's guide Lesson plan(s) Permanent material(s)[a] Computer software	Calculator Computer software Internet site(s)
Island Explorers Program	Science	4–7	Lesson plan(s)	Internet site(s)

Appendix II
Math and Science Materials That Became Available During Fiscal Year 1999, by Agency

(Continued From Previous Page)

Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
A Resource Guide for Oceanography and Coastal Processes Developed for Elementary, Middle and High School Teachers	Science	K–12	Teacher's guide Lesson plan(s) Resource guide	Internet site(s)
Beach Explorations: Pacific Information Cards	Science	5–9	Teacher's guide Lesson plan(s)	
GLOBE Teacher's Guide, Video and Web Materials	Math and science	K–12	Teacher's guide Instructional video Permanent materials[2] Internet sites	Calculator Computer software Internet sites Scientific measurement instruments Satellite imagery Global positioning system receivers
The St. Jones Delaware National Estuarine Research Reserve Curriculum	Science	4–12 Undergraduates	Teacher's guide Lesson plan(s)	Calculator Computer software Internet site(s)
MARE (Marine Activities, Resources and Education) East Coast Supplementary Modules	Science	K–8	Lesson plan(s) Permanent materials CD-ROM	Internet site(s)
Long-Term Ecosystem Observatory Internet Curriculum	Science	5–12	Lesson plan(s)	Internet site(s)
Estuary Net	Science	9–12	Teacher's guide Lesson plan(s) Textbook	Calculator Computer software Internet site(s) Water quality monitoring equipment
Estuary Live	Science	K–12 Undergraduates	Teacher's guide Lesson plan(s) Instructional video(s) Permanent material(s)[3]	Computer software Internet site(s) Real-time digital media
From Whaling to Watching	Science	6–8	Teacher's guide Instructional video(s) Permanent material(s)[3]	Calculator Internet site(s)
Gulf of the Farallines National Marine Sanctuary	Science	K–12	Permanent material(s)[3] Activities Slide shows Fact sheets	Internet site(s)
USGS				
Earthquakes Everyday	Science	3–12 Undergraduates	Lesson plan(s) Internet site(s)	Internet site(s) Computer software
Africa GIS-Based Project	Science	9–12	Lesson plan(s) Internet site(s) Computer software	Internet site(s) Computer software

(Continued From Previous Page)

Material name	Primary orientation	Targeted grade levels	Material set components	Technology used in implementing materials
County School Patterns	Science	9–12	Lesson plan(s) Computer software Internet site(s)	Internet site(s) Computer software
74,796 Ready-to-Go Map Mysteries	Science	4–12 Undergraduates	Lesson plan(s) Internet site(s)	Internet site(s)
GLOBE: Satellite Imagery Packets	Math and science	3–12	Teacher's guide Lesson plan(s) Permanent material(s)[a]	Calculator Computer software Internet site(s)
Echo the Bat or Imagers	Science	4–8	Teacher's guide Lesson plan(s) Permanent material(s)[b]	Internet site(s)
Water Matters, Vol. 3	Science	3–8	Teacher's guide Lesson plan(s) Permanent material(s)[b]	Calculator Internet site(s)

[a]Such as chemicals.

[b]Such as posters.

[c]Information on a second My Health, My World material set for kindergarten through 4th grade was received too late to be included in this report.

Comments From the Department of Education

UNITED STATES DEPARTMENT OF EDUCATION

June 15, 2000

Ms. Cynthia M. Fagnoni
Director
Education, Workforce,
and Income Security Issues
Health, Education and Human Services Division
United States General Accounting Office
Washington, DC 20548

Dear Ms. Fagnoni:

Thank you for your letter to the Secretary, offering the Department of Education (ED) the opportunity to comment on the General Accounting Office's Draft Report, *Elementary and Secondary Education, Comprehensive Information about Federally Funded Math and Science Materials Not Readily Accessible*.

In general, the draft report does a thorough job of conveying the extent and complexity of the federal investment in science and mathematics education. As the report notes, this investment is spread across several federal agencies supporting a wide range of activities. However, certain areas of the report need additional clarification or correction.

The draft report's characterization of the Department's efforts in supporting the development of curriculum materials should be made clearer. In several instances, the report's language could be read to suggest that ED itself produces or develops curriculum materials. This would be an inaccurate portrayal of the Department's support through grants of field developed materials.

The report correctly notes that although not all agencies consistently submit materials to the Eisenhower National Clearinghouse (ENC), Education Department staff do contact agencies annually to update and compile information about federally supported resources. In this regard, the report could more clearly portray ENC's role as specified in the legislation authorizing this clearinghouse. Further, the report should be corrected to indicate that ENC is administered by the Office of Educational Research and Improvement (OERI).

We are concerned that the draft report could convey an intention by the Department to evaluate "all" materials that had not been assessed for quality at the time of the study. Although ED systematically reviews all internal publications, the Department does not systematically collect information from users of materials produced by grantees. Program officers have the responsibility to review project products as part of their monitoring activities. This internal role or function should not be construed as an external review to evaluate products in the context of how well products are used by the public. Often such reviews take the form of program evaluations, which are conducted on a program by program basis. Funding for program evaluations are subject to budgetary constraints. Although the Education Department General Administrative Regulations make provision for Federal evaluation, commitments for program evaluations are generally made in connection with approved fiscal year budgets.

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The report's recommendation that the Math and Science Expert Panel review all materials may be overly ambitious. Under the authorizing statute (20 U.S.C. 6041(d)), the current role of the panel allows for the voluntary submission of projects, programs, and practices for a designation as "promising" or "exemplary." Submitters are requested to include available evaluation data and information about the proposed program's effectiveness. Use of the Expert Panel for systematic evaluation of all K-12 math and science materials developed with federal support may be costly. The role of the panel would possibly change from one providing recommendations to the Secretary about practices potentially beneficial to the public to one of federal external evaluator.

Again, we appreciate the opportunity to comment on this draft report.

Sincerely,

Frank S. Holleman III

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Comments From the National Science Foundation

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

NSF

OFFICE OF THE
ASSISTANT DIRECTOR
FOR EDUCATION AND
HUMAN RESOURCES

June 14, 2000

Ms. Cynthia M. Fagnoni
Director, Education, Workforce,
and Income Security Issues
Health, Education, and
Human Services Division
U.S. General Accounting Office
Washington, DC 20548

Dear Ms. Fagnoni:

This will acknowledge and respond to the draft General Accounting Office (GAO) report *Elementary and Secondary Education: Comprehensive Information About Federally Funded Math and Science Materials Not Readily Accessible*. The National Science Foundation (NSF) has cooperated extensively with the GAO's Boston, Massachusetts Field Office in its preparation of this report, beginning with prefatory meetings during August, 1999, and culminating with a formal exit conference between GAO and NSF staff on April 28, 2000.

The report is based on a GAO survey questionnaire which NSF was asked to complete for instructional materials development projects active in Fiscal Year 1999. Despite relatively comprehensive interactions between our two agencies concerning the survey and its purposes, the report as currently written contains little to suggest that a thoughtful analysis of NSF activities in the field of mathematics and science materials development was accomplished. The principal reason is the flawed design of the GAO information collection mechanism.

Development of high-quality materials has a long time line. Since the NSF develops mathematics and science materials through grants, projects active with FY 1999 funds were in development and testing stages. Therefore, their materials did not become available to the public during that year. The NSF staff advised GAO repeatedly that its survey design (focusing on materials both funded and available to the public in FY 1999) was not compatible with Foundation processes, and that it would not enable any meaningful examination of NSF materials products. Nevertheless, the survey went forward without change, and critical information about the NSF process was omitted from your draft report.

Telephone (703) 306-1600 FAX (703) 306-0399

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The GAO survey did not permit agencies to provide planned distribution or evaluation data on materials not released in FY 1999. NSF was, therefore, not able to provide this important information on any of the Foundation's 93 active projects in FY 1999. Additionally, while NSF staff offered to provide data on its projects funded in earlier years—and whose materials were available to the public in FY 1999—they were explicitly advised by GAO staff that this would not be appropriate as it would not be in line with the survey parameters.

The purported emphasis of the GAO survey involved an examination of comprehensive instructional materials; however, with no descriptions of NSF-supported projects appearing within the report, the discussion of comprehensive curricula and materials in mathematics and science education is limited at best.

Based on the design of the study, the draft report implicitly characterizes NSF as ineffective in developing mathematics and science materials. It also presents a distorted picture of the federal effort in this area because neither NSF-funded materials nor NSF's approaches to dissemination and evaluation are reflected in the discussion. Such information is essential to any reader's understanding of the federal effort in mathematics and science materials development.

Enclosed with this correspondence are editorial recommendations for improving language with respect to NSF which will help overcome some of the deficiencies mentioned above. It is our sentiment that the study should be held in abeyance until appropriate corrections to the survey methodology can be made. The Foundation would welcome the opportunity to work with GAO in ensuring the production of a report which both adequately reflects NSF's major role and provides an accurate picture of the larger federal efforts in mathematics and science materials development.

Sincerely,

Judith Sunley

Judith Sunley
Interim Assistant Director

Enclosure

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Department of Health and Human Services

DEPARTMENT OF HEALTH & HUMAN SERVICES — Public Health Service

National Institutes of Health
Bethesda, Maryland 20892

JUN 14 2000

Ms. Cynthia M. Fagnoni
Director, Education, Workforce, and Income Security Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Ms. Fagnoni:

The National Institutes of Health appreciates the opportunity to comment on the draft GAO report, *Elementary and Secondary Education: Comprehensive Information About Federally Funded Math and Science Materials Not Readily Accessible*.

Although we defer to the Department of Education and the National Science Foundation to address the recommendations, we feel that implementation of the two recommendations, to assure that agencies submit materials to the Eisenhower National Clearinghouse and to assess/evaluate materials, would benefit the education process. The report also alerts us, for the first time, to the mandatory requirement that materials be sent to the Clearinghouse and reinforces the emphasis NIH has placed on the assessment and evaluation of NIH science education programs. We have included general comments (Attachment A) and technical comments (Attachment B) on separate attachments.

We appreciate the opportunity to provide comments to your final report. If you have any questions, please contact Patty Quast in the Office of Management Assessment at 301-402-8264.

Sincerely yours,

Anthony L. Itteilag
Deputy Director for Management

Attachments

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Attachment A

General Comments

NIH is concerned that, throughout the report, a great deal of emphasis is placed on the fact that agencies are not sending copies of the materials they develop to the Eisenhower National Clearinghouse (Clearinghouse), as required by the act establishing the clearinghouse. NIH was not aware of this requirement and was not notified about it by the Department of Education or the Clearinghouse. We would like to see, in the final report, the citation of the requirement, the date it became effective, and the guidelines for determining which materials should be submitted to the Clearinghouse. The report says, on page 14, that "...officials at NIH said that Eisenhower staff contacted them once a year, generally in the fall. At that time NIH staff look to see what materials have become available and decide about whether to submit them based on how the materials have been received by their intended audience." This does not adequately reflect the NIH system in place for providing material to the Clearinghouse, and makes the NIH process appear negative. A more accurate statement would be: "...NIH officials said that the Eisenhower staff contact them once a year to update NIH information contained in the Clearinghouse. The NIH uses this as a trigger to update any information contained in the Clearinghouse, including removing materials no longer current and adding materials that have passed initial quality assessment review and are being disseminated by the agency." We felt that this process assures that once a year we review recently produced NIH instructional materials. We do not submit materials unless we have strong assurance, through pilot and field testing, that they will be useful for the intended audience. Once materials developed by the NIH are disseminated, they are entered into the Clearinghouse during the next annual review. In addition, the report fails to mention that there are other methods for dissemination of education materials besides the Clearinghouse. For example, NIH materials are also disseminated through the Federal Depository Libraries.

The statement on page six of the report that, "...only NSF and Education developed educational materials as part of their efforts to improve math and science teaching and learning" is incorrect. NIH also has the goal of improving science teaching and learning. At NIH, our expertise in scientific content is combined with the expertise of educational specialists to form a team in the development of instructional materials. As an example, the *NIH Health Science Curriculum Online*, developed in-house, used a qualified K-12 instructional specialist to develop the curriculum. One project NIH has developed that is designed to improve science teaching is the NIH Curriculum Supplement Series. These supplements are beginning to be used for pre-service training as well as in-service training. A great deal of staff time and planning is going into this teacher development effort. Highly respected instructional materials developers were used to create materials closely aligned to the National Academy of Sciences' (NAS) *National Science Education Standards*. This was done to promote best practices by science teachers and to improve the quality and equity of student outcomes.

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On page 5, the report states that, "Several national organizations, including the National Council of Teachers of Mathematics and the American Association for the Advancement of Science, have developed curriculum standards for mathematics and science education." We would like to suggest adding the NAS *National Science Education Standards*. These are at least as important and influential as the standards of the two organizations mentioned and are currently being used by a number of states as the basis for state-specific teaching standards.

The report states on page 12 that, "Some efforts by these separate offices to develop materials were coordinated while others were not. For example, NIH's Office of Science Education coordinated and helped to fund the Curriculum Supplement Series developed by other institutes within the NIH. However, during fiscal year 1999, six NIH institutes developed materials outside of the Curriculum Supplement Series." This example is not accurate. NIH does coordinate its efforts to develop materials. Through intragency communication systems such as the Science Education Resource Group, the OSE and other NIH institutes/centers are aware of the development of other NIH curriculum projects and, in some cases, provide input to each others' projects. The OSE consults with the NIH institutes on a number of science education products and serves as a source of educational advice and expertise.

Pages 17 and 18, Table 4, *Quality Assessment Status of 61 Mathematics and Science Materials That Became Available in Fiscal Year 1999, By Agency*, shows that, of nine NIH projects that were produced, only four had been assessed for quality. This is not accurate. NIH assesses all of its materials before they are disseminated through pilot studies and/or field trials and the materials are revised as appropriate before release. Since proper quantitative and/or qualitative evaluations take two or three years to complete the materials listed are too new to have been evaluated. The report notes two organizations that have programs to assess the quality of educational materials. NIH plans to explore the Education assessment services mentioned in the draft. However, the services available from the American Association for the Advancement of Science do not meet our needs since our instructional materials were developed to meet the NAS standards. We are interested in how the materials interface with individual state science standards and we believe this information is key for our materials to be used in a state and are testing this hypothesis in New Mexico.

On page 18, the word "generally" should be added to the statement that agency officials did not, "collect information on the extent to which the materials were actually used...." NIH has made and continues to make efforts to gather that information while dealing with Federal requirements regarding surveys, data collection, and privacy issues.

On page 18, the sentence that states, "First, if the primary purpose of the materials was not to educate kindergarten through 12th grade students in the classroom but rather to increase public awareness of a specific subject matter, the materials may have been disseminated through channels for noneducational material..." is somewhat unclear and incorrect. At NIH, even science education materials developed for teachers to use in the classroom may be distributed through such non-traditional avenues. For example,

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many scientific professional associations, such as the Society for the Advancement of Chicanos and Native Americans in Science and the Society of Toxicology, have major initiatives in K-12 science education. They bring teachers to their conferences for training and the dissemination of materials, and use chapter members throughout the country to promote use of the materials. It would be an enormous expense to identify and track these non-traditional dissemination methods.

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National Aeronautics and Space Administration

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

APR 8 2002

FE

Cynthia M. Fagnoni
Director, Education, Workforce
and Income Security Issues
United States General Accounting Office
Washington, DC 20548

Dear Ms. Fagnoni:

Thank you for the opportunity to comment on the General Accounting Office review of K-12 mathematics and science education materials. Staff from NASA's Education Division provided information to the GAO review team. We offer the following specific comments:

1. NASA supports the recommendation that the Eisenhower National Clearinghouse (ENC) be the repository of all federally-supported science and mathematics materials. As the GAO report notes, NASA already has a policy that all our materials are sent to the ENC and we will continue to ensure that our products are submitted to the ENC.
2. NASA also endorses the recommendation that all materials be evaluated. We have already responded to this recommendation having created an online data collection and evaluation system.

Again, we appreciate the opportunity to comment on the report.

Sincerely,

Vicki A. Novak

Vicki A. Novak
Associate Administrator for
Human Resources and Education

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GAO Contacts and Staff Acknowledgments

GAO Contacts

Harriet Ganson, Assistant Director, (202) 512-9045
Arthur T. Merriam, Jr., Senior Evaluator, (617) 565-7541

Staff Acknowledgments

In addition to those named above, Patrick DiBattista, Lara L. Carreon, Christy B. Muldoon, and Salvatore F. Sorbello, Jr., made key contributions to this report.

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